

## Increased Oil Production and Reserves from Improved Completion Techniques in the Bluebell Field -- Class I

### *Utah Geological Survey*

Green River & Wasatch Fm.

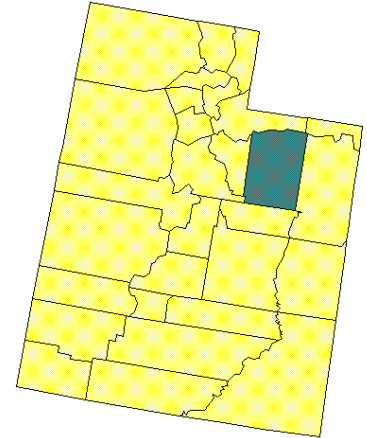
Bluebell Field

@ 10,000 to 14,000 ft.

Duchesne County, Utah

Eocene Age

Uinta Basin



**DE-FC22-93BC14953**

**Contract Period:**

9/30/1993 to 9/29/1999

**DOE Project Manager:**

Gary D. Walker

918/ 699-2083

[walker@npto.doe.gov](mailto:walker@npto.doe.gov)

**Contractor:**

Utah Geological Survey  
1594 West North Temple,  
Suite 3110

P.O. Box 146100

Salt Lake City, UT 84114

**Principal Investigator:**

Craig Morgan

Utah Geological Survey

P.O. Box 146100

Salt Lake City, UT 84111

801/ 537-3300

**Objective:** The project will develop a multidisciplinary reservoir characterization approach to overcoming low petroleum recovery caused by poor completion practices in fractured, clayey reservoirs in the Bluebell field, Uinta Basin, northeast Utah. A well recompletion, a well redrill, and a new well will demonstrate the application of multidisciplinary geological and engineering techniques, such as facies analysis and fracture trend analysis to improve production and increase reserves. The technology transfer plan will include workshops and database distribution.

**Technologies Used:** Outcrop analysis, well testing and hydraulic fracturing, geostatistics, numerical simulation, borehole imaging logs, and infill drilling, improved completion techniques.

**Background:** The Uinta Basin in northeast Utah is the most prolific petroleum province in Utah. Most of the production in the giant Altamont-Bluebell-Cedar Rim fields complex is from multiple, low-matrix-porosity sandstone units that were deposited in lacustrine fluvial-delta systems. The primary problem with completing wells in the Bluebell field is adequately identifying pay zones in the thick, heterogeneous sequence. As a result, existing well completions suffer from thief zones, unperforated oil-bearing zones, and inefficient placement of chemical treatments. Bluebell field has produced 118 million barrels of oil. Technology has the potential to increase production by 5 -10%.

**Incremental Production:** Michelle Ute 1-7 well incremental production is averaging 10 bbls per day. Malnar Pike 1-17A1E well incremental production is averaging about 30 bbls per day. Completion of the new well, John Chasel 3-6A2, has been re-designed. The original completion failed due to collapsed casing. The well was completed at shallower intervals.

**Expected Benefits and Applications:** To identify oil-bearing beds, improved well completion techniques, and extended overall recovery rate per well and field. The unique features of Bluebell field include: (1) a very thick pay zone, (2) no interwell correlation of producing horizons, (3) a low matrix reservoir porosity, and (4) nonuniform completion techniques. The gains made in the recompletion work in the first two wells were applied to completion work in the third demonstration well. Logging analysis applied to the John Chasel 3-6A2 well greatly reduced the number of beds that were perforated and identified several potential high-water beds which were avoided.

**Accomplishments:** Pre-completion logging analysis was instrumental in reducing the number of zones selected for completion in the John Chasel 3-6A2 well. Typically 40 to 60 beds are selected for completion based mainly on drilling shows. In the new well, 19 zones were selected for completion based on TDT and dipole shear log analysis and exceptional drilling shows. The benefits include lower completion costs, increased productivity of treated zones, and a reduction in produced water. Chasel 3-6A2 was drilled in August 1998 to a TD just under 16,000 feet. The Flagstaff Member of the Green River Formation was the target. This is only the second well drilled to this depth in the Bluebell field. The objective is to use the geophysical logs to select and limit the number of non oil bearing formation beds perforated during well completions. The gains made in the recompletion work in steps one and two were applied to completion work in step three of the Demonstration Program. Logging analysis applied to the John Chasel 3-6A2 well greatly reduced the number of beds that were perforated and identified several potential high-water beds which were avoided. A series of problems were encountered which were unsurmountable and the original perforated beds have been abandoned.

**Publications:** (1) Montgomery, S.L., and Morgan, C.D., 1998, "Bluebell Field, Uinta Basin: Reservoir Characterization for Improved Well Completion and Oil Recovery": American Association of Petroleum Geologists Bulletin, v.82, no. 6, p. 1113-1132. (2) Morgan, C., 1999, "Application of the bed isolation completion technique in a mature well in the Bluebell field, Uinta Basin, Utah", The CLASS ACT, Vol. 5, No. 2, Summer, 1999. (3) Morgan, C. D., and M. D. Deo, 1999, "Increased oil production and reserves from improved completion techniques in the Bluebell Field, Uinta Basin, Utah", Annual report October 1, 1997 to September 30, 1998, DOE/BC14953-21 (OSTI ID: 6089)

**Recent/Upcoming Technology Transfer Events:** (1) Morgan, Craig, "Increased Oil Production and Reserves from Improved Completion Techniques in the Bluebell Field, Uinta Basin, Utah": Fractured Reservoirs: A Symposium on Current Research, Modeling, and Enhanced Recovery Techniques, Salt Lake City, Utah, October 23, 1998. (2) Recompletion results were also presented at Petroleum Days in Vernal, UT, May 13-14, 1998. (3) Deo, Milind, "Fractured Reservoir Modeling in the Bluebell Field, Uinta Basin, Utah": Fractured Reservoirs: A Symposium on Current Research, Modeling, and Enhanced Recovery Techniques, Salt Lake City, Utah, October 23, 1998. (4) Display on the Bluebell field project, PTTC Symposium, and Interstate Oil and Gas Commission

Compact meeting, Salt Lake City, UT, December 6-8, 1998. (5) C. D. Morgan, "Using detailed Gamma-Ray log correlations to understand depositional patterns of a fluvial-deltaic lacustrine reservoir", poster; AAPG Annual Convention, San Antonio, TX, April 11-14, 1999. (6) Morgan, C., "Bed-isolation treatments of a mature well in the bluebell field of the Uinta basin, Utah, that have undergone numerous high volume shot-gun completions", Poster, DOE Oil & Gas Conference, Dallas, TX, June 28-30, 1999. (7) The project may be accessed through its Homepage at [www.ugs.state.ut.us/bluebell.htm](http://www.ugs.state.ut.us/bluebell.htm).

**Project Status:** Project completed. Final report published Januray 2000.